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John H. Blake

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RECENT PROGRESS IN PATHOLOGY AND PATHOLOGICAL ANATOMY.

BY R. H. FITZ, M. D.

PATHOLOGY.



~~##~~ *Recognition of Bacteria.* — After referring to the difficulties in the way of determining by optical and chemical means the nature of the globular forms of bacteria, Hiller¹ refers to his own experiments, and concludes that his methods are such as may permit bacteria to be recognized and to be distinguished from bodies of a similar appearance. To make these methods available they must be properly employed, and with a sufficient botanical knowledge of the life and growth of the vegetation. These means are optical and chemical, supplemented by culture.

By optical means are determined the characteristic forms of growths — as rods and threads — and the characteristic movements of monads and rods in very fluid media. The manner of their growth and multiplication is also thus ascertained, the rule being that free monads and rods can only develop into free individuals of the same sort under appearances of motion, and that a growth of motionless bacteria is always a continuous one, necessarily leading to the formation of threads or masses. The granular masses may be seen to be firm, continuous, membraniform, or loose, movable, forming an emulsion.

The chemical means serve to distinguish granular detritus imbedded in albuminous material, such as results from the death of cells, from membraniform masses of vegetation, since the former is dissolved, liquefied by caustic potash, and is coagulated by alcohol, whereas the latter are unaffected by these reagents. Further, if tissues are macerated for an hour in a ten per cent. solution of caustic potash, monads contained in them will be stained yellow by iodine; fat granules are not colored.

Finally, by culture the vitality of the organisms may be determined. The usual precautions are insisted upon, and bent capillary tubes are

¹ Virchow's Archiv, vol. lxii., 1875.

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recommended for the examination of the blood, the upper end being closed with cotton, the lower end sealed.

Bacteria in Endocarditis and Acute Rheumatism. — Previous to 1870 but little general interest was manifested in certain forms of endocarditis, which had been more frequently observed in puerperal conditions, though Virchow had repeatedly called attention to the matter, had published several cases, and had spoken of the form as an acute, ulcerating (diphtheritic) endocarditis.¹

Meyer² published a brochure in 1870 on ulcerated endocarditis, wherein he spoke of its great clinical importance, and of the various conditions with which it was associated, as emboli, metastatic abscesses, hæmorrhages, parenchymatous alterations, etc. The disease was spoken of as a grave one, and was regarded in the same light as pyæmia. The ulceration of the valves of the heart was considered to be due to an exciting cause, as articular rheumatism, febrile processes of a general character, puerperal diseases, typhus, exanthemata, etc., which acted upon an already diseased endocardium, as the remains of an antecedent valvular endocarditis were usually present.

The emboli producing the secondary changes were regarded as elements floated away from the endocardium, which were chemically injurious, and similar to pus, or of a purulent character.

Virchow³ referred to this subject at considerable length in a communication to the Berlin Obstetrical Society, stating that usually such decided alterations of the uterus and its appendages were present that the endocarditis might be regarded rather as a complication. There were also cases where the endocarditis was the main disturbance, the uterus being relatively unaltered. It was peculiar to the process that the changes in the valves, which at the outset resembled those of simple endocarditis, terminated in softening and rupture. Multiple embolism was thus likely to occur, the results of which were minute nodules resembling abscesses. Such forms may be exceedingly malignant in character, therein seeming to be influenced by the accompanying puerperal affection, as diphtheritis, phlegmonous inflammation of the broad ligament, etc. The condition of the valves resembled a diphtheritic mass, composed of granular particles, and it was considered probable that the changes occurring in the diseased valve were allied to the diphtheritic process. It was also admitted that minute organisms of the same apparent character were present in the circulating blood during life, which might "take root" in the endocardial surface, and multiply. In some instances Virchow found similar granular masses in the metas-

¹ *Gesammelte Abhandlungen*, 1856, page 721.

² *Ueber die Endocarditis ulcerosa*, 1870. *Jahresbericht von Virchow und Hirsch für* 1871, ii. 92.

³ *Ueber die Chlorose und Endocarditis puerperalis*. 1872.

tatic nodules; he had seen them also in the vessels of the choroid, in the spleen and kidneys, not only in but also outside the vessels. He had also found them in the kidneys from cases of putrid cystitis, and his view of their parasitic nature was corroborated by the observations of Von Recklinghausen.¹ This pathologist ascertained that miliary accumulations of micrococci were the cause of the small abscesses found in a large number of infectious diseases, particularly in pyæmia and puerperal fever; also in typhus, acute articular rheumatism, urinary infiltration, and pulmonary gangrene. They were found most frequently in the kidneys, usually surrounded by a zone of tissue, hæmorrhagic or infiltrated with pus, though there might be no surrounding reactive appearances where the condition was a recent one. In many instances there was no endocarditis. On one occasion where slight depositions were found upon the mitral valve, he considered it more probable that such were metastatic in the same sense as their presence in other organs.

Long before this, Beckmann² spoke of the occurrence of a finely granular mass in the renal tubules, Malpighian bodies and capsules of those persons who had died of pyæmia. He stated further that the individual granules bore a close resemblance to vibrios, and at times were found to present vibratory movements.

Heiberg³ reported a case of puerperal ulcerative endocarditis, where granular masses were present in the heart, and which he considered of a parasitic nature. He gave also a *résumé* of a case of Winge's, communicated to the Swedish Medical Society in 1869, in which not only were the masses present in the heart, but they were also found in the embolic nodules. In both these cases the granules were regarded as fungous growths, and it was supposed that their germs had entered from without.

It was further suggested that every ulcerative endocarditis might be "pyæmic (or puerperal), an infectious disease due to the entrance of noxious substances (fungi?) from without, a view corresponding tolerably with Virchow's opinion that the ulceration was of a diphtheritic character."

Under the title A Case of Capillary Embolism, Beckmann⁴ reported one whose clinical course suggested that of typhus with petechiæ, but the anatomical appearances were those of ulcerative endocarditis and multiple embolism. The diseased valve bore finely granular masses not readily acted upon by reagents. Minute spots in the substance of the heart contained capillaries in which was a similar granular mass. Like conditions were found in the kidneys and in the vessels of the pia mater.

¹ Centralblatt für die medicinischen Wissenschaften, 1871, page 713.

² Virchow's Archiv, 1856, ix. 221.

³ Virchow's Archiv, 1872, lvi. 407.

⁴ Virchow's Archiv, 1857, xii. 59.

An article on diphtheritic endocarditis, by Eberth,¹ now appeared. A special form of disease of the valves of the heart in pyæmia had suggested itself to him as due to minute organisms. It appeared like the acute rheumatic forms, but masses of spherical bacteria were found upon the surfaces of the valves. He attributed to these the property of producing secondary suppuration independently of the transfer of coarser particles.

His case is recorded as one of malignant ulcerative endocarditis, pursuing an independent course, with the symptoms and characteristic alterations of pyæmia, but quite free from the presence of a diphtheritic wound. Granules regarded as globular bacteria were found in the heart in punctate hæmorrhages and abscesses, and as emboli in the Malpighian corpuscles. A local source for their admission into the blood could not be ascertained.

In the same year Lanceraux² suggested the view that a paludal poison gave rise to the ulcerative, vegetative form of endocarditis, the clinical features of which resembled those of septicæmia.

Eberth³ then reported a second case which proved rapidly fatal, with ulceration and diphtheritic patches upon the mitral valve, and miliary abscesses in the heart and kidneys, the vessels in which contained punctate bacteria. Colonies of bacteria were found also in the swollen mesenteric glands. There was no wound through which the spores could have entered from without.

The corneæ of rabbits were inoculated with the contents of the cardiac and renal abscesses; profuse suppuration and perforation followed, and a decided growth of bacteria was found here.

A case of primary diphtheritic endocarditis was next published by Maier.⁴ The aortic and pulmonary valves were thickened, the former ulcerated and perforated. From the perforated spot a canal extended through the base of the auricular septum into the left auricle, where was a ragged opening. A large abscess was found beneath the capsule of the right kidney, communicating with the renal pelvis; elsewhere in this organ were small red and yellow spots. A finely granular mass like that found in diphtheritic mucous membranes was observed on the edges of the perforation of the aorta, and was considered to be composed of globular forms of bacteria. Similar granules were scraped from the wall of the abscess in the kidney, and others were found between the tubes, in the Malpighian capsules; also in the minute yellow spots. The case was regarded as identical with Eberth's, though its course was less rapid. The onset of the disease, with chills, high tem-

¹ Virchow's Archiv, 1873, lvii. 228.

² Boston Medical and Surgical Journal, October 16, 1873. Second Report on Pathology.

³ Untersuchungen aus dem pathologischen Institut zu Zurich, 1873. Jahresbericht von Virchow und Hirsch, 1873, i 213.

⁴ Virchow's Archiv, 1874, lxii. 145.

perature, headache, diarrhœa, stitch in the side (splenic enlargement), was very characteristic. It progressed with high temperature, congestion of various organs and a tendency to hæmorrhages in them, diarrhœa, and marked nervous symptoms indicative of a septicæmia. The nervous symptoms were twitchings of the face, tetanus of the cervical muscles, violent headaches; and later, babbling, tremors, involuntary evacuations, and sopor.

The symptoms and post-mortem appearances indicated a complication of septicæmia and embolism, the main affection being an endocarditis (probably primary) and a nephritis. Here, too, there was no sufficient evidence of the manner by which the spores entered the system.

The septic nature of some forms of acute articular rheumatism is very strongly suggested by the case reported by Fleischhauer.¹ He alludes to the occurrence of acute inflammation of the joints in puerperal fever, scarlatina, diphtheritis, typhus, dysentery, erysipelas, ulcerative endocarditis, and pyæmia. It is then suggested that a like or similar cause may be active in all, a view favored by the discovery of spores in almost all the above-mentioned diseases.

The clinical course was that of rheumatism, lasting four weeks, during the last two of which the symptoms were of so acute a character as to compel the patient to take to her bed. Miliary abscesses were found in both lungs, kidneys, heart, and in various muscles; there was also a suppurative parotitis and synovitis of various joints.

The renal abscesses contained granules whose optical and chemical relations were those of micrococci. These were present in the tubules mainly; between them and the more normal parts of the kidney was a zone of pus corpuscles. The organisms, at times, extended into the surrounding tissue, apparently having escaped from the tubes. The muscular abscesses, the largest of which were in close relation to the inflamed joints, consisted of agglomerations of globular bacteria surrounded by a layer of pus corpuscles. The same was true of the abscesses in the heart. Those in the lungs often presented as centres two or more alveoli filled with micrococci, surrounding which was pus, and still farther out the alveoli were filled with blood. In larger abscesses the bacteria were present in capillaries and veins. In the vessels and ducts of the inflamed parotid gland, colonies of micrococci were found. The examination of the joints gave negative results so far as these bodies were concerned. The manner of their invasion was obscure. It was considered that this case might be placed in the category of those of diphtheritic endocarditis previously referred to, notwithstanding the absence of that affection here.

Typhoid Fever.—In blood taken from the finger of a typhoid patient in the second week of the disease, Eichhorst² found five gran-

¹ Virchow's Archiv, 1875, lxii. 386.

² Deutsches Archiv für klinische Medicin, 1874, xiv. 223.

ular, colorless cells, which were observed for five days. These were from four to six times larger in diameter than the white blood corpuscles, and contained from two to seven yellow disks entirely resembling red blood corpuscles, though somewhat paler.

They could be freed from the larger cells by pressure and the addition of water. Some of the cells presented projections like those of contractile cells. Otherwise the blood was not abnormal; even the small glistening granules, generally so abundant in febrile blood, were but scanty.

Klein¹ states that he found, in sections from hardened specimens, appearances in the mucous membrane upon and near Peyer's patches which show that an absorption of peculiar organisms occurs, and that they are transmitted along the lymph and blood vessels of the mucous membrane. In a case examined seven days after the headache, peculiar round, yellowish-brown bodies were found in the crypts of Lieberkühn. They varied in size from one fourth to three times that of a human red corpuscle, and were generally grouped in masses, then appearing of an olive-green color; on the edges of these groups, appearances of subdivision were indicated by kidney and biscuit shaped bodies. Similar bodies were present within the mucous membrane, apparently contained in lymphoid cells. These micrococci were in a genetic relation to a mycelium of a greenish-yellow color.

Masses of greenish-yellow micrococci were found penetrating the surface of the mucous membrane from without, also extending from the crypts of Lieberkühn into the surrounding lymph-passages.

The Origin of Giant Cells.— These bodies, first discovered by Robin in bones, and called by him "plaques à plusieurs noyaux," have attracted considerable attention, more particularly on account of their supposed intimate connection with tubercles, of which they are so frequently found to be a constituent.

Friedländer¹ gives a detailed account of their appearance under normal and pathological conditions, and explains at some length his idea of their relation to tuberculosis. He admits that they may arise from the enlargement of epithelial and endothelial cells, associated with an increase in the number of nuclei; also during the acute atrophy of fat tissue with a like increase of nuclei, as observed by Flemming.

Though the fact is accepted that they may be present within vessels, Friedländer does not accept the theory of their origin in such places. In tubercles, particularly, such has not been demonstrated, despite the many attempts to prove their origin here from the endothelium of the blood and lymph vessels. Wandering giant cells have been discovered in bones by Rustitzky, and Friedländer has observed an active change of shape in those present in tubercles.

¹ Centralblatt für die medicinischen Wissenschaften, 1874, xliv. 692.

² Berliner klinische Wochenschrift, No. 37, 1874.

Ziegler¹ has been able to produce these giant cells from white blood corpuscles. Small pieces of glass of various shapes were taken, their edges and angles rounded, and a bit of thin glass of corresponding size was so cemented between the plates that a capillary space was obtained, freely accessible from without. These were then placed beneath the skin and the peritoneum of dogs and rabbits, or were carefully introduced into one of the great cavities of the body, with the idea that the white blood corpuscles might enter the space between the pieces of glass and undergo certain changes. It was expected that at the outset nutriment might be derived from the surrounding lymph, and that later the new formation of vessels might take place, and thus eventually a fibrous tissue be formed. Should such an event occur, it would be certain that the white corpuscles had served as the formative material.

After numerous experiments his expectations were realized. The plates usually remained in position from ten to twenty-five days, were then removed, exposed to staining fluids, and were eventually preserved in glycerine. In all cases white corpuscles entered the capillary space, and underwent retrograde or progressive changes. The latter were twofold in character, and consisted in the formation of a reticulated tissue containing epithelial cells and numerous giant cells; the resemblance to the structure of tubercle was most striking, and when the giant cells occurred vessels were not found. The other change was due to the formation of connective tissue and vessels.

From the similarity of the results of the first change to certain forms of tubercles, Ziegler concluded that the tubercle with its giant cells is an inflammatory growth in which the white blood corpuscles collect at certain points (probably intracanalicular), and become peculiarly developed. This seems to be dependent upon a feeble nutrition of the cells, since the same does not suffice to form a new connective tissue. The giant cell is therefore regarded as the incomplete new formation of cells.

Jaundice. — Legg and Audigné² have made experiments with reference to mechanical jaundice, produced by the ligature of bile-ducts, the former on cats, the latter on dogs. The cats died within twenty days, but not from peritonitis. Conjunctival jaundice came on late from ten to fourteen days after the operation. The urine was not tested for bile-pigment, as that of cats and dogs often contains the same under normal conditions. Audigné states, however, that it becomes evident in the urine within two or three hours after the obstruction of the excretory ducts, though jaundice of the skin is appreciable only some time after the appearance of the pigment in the urine.

¹ Centralblatt für die medicinischen Wissenschaften, No. 51, 1874.

² St. Bartholomew's Hospital Reports, ix. 161.

³ Gazette Médicale, No. 1, 1874; Revue des Sciences Médicales, iv. 103.

Legg observed that the sugar was absent from the urine, puncture of the fourth ventricle being made on the sixth day after the ligature of the ducts. He states further that the interstitial tissue of the liver became increased after this experiment, and that the liver-cells were atrophied but not particularly pigmented.

Nothnagel¹ found casts in the urine of jaundiced persons, the icterus being marked, and bile-acids present. These casts were generally hyaline, varying in shape and size, but were not colored yellow. Albumen was present or absent.

Feltz and Ritter² injected fresh bile into the veins of animals, and observed the following effects:—

Tetaniform convulsions, followed by coma, loss of sensibility, and death, when the doses were large; a slight diminution of the pulse, and a falling of the temperature from one to two degrees; decided salivation, bilious vomiting, and, at times, bloody diarrhœa. Fat globules, and an increase of fat and cholesterine were found in the blood; the blood corpuscles showed a tendency to run together, and when shaken with oxygen would not take up so much as usual, though the oxygen was diminished, and the carbonic acid increased. The amount of urine was increased, but contained albumen and biliary coloring matter only when very large doses were given; soon after the injection the urine regularly contained a substance strongly resembling indican; when the animal died early, the urine was of a bloody color from the presence of soluble blood coloring matter.

PATHOLOGICAL ANATOMY.

Results of Injury to the Brain.—Nothnagel³ states that by injury to certain portions of the surface of the brain of rabbits (in the vicinity of the furrow upon the same) by means of a needle, hæmorrhages into the lungs occur. These are often so extreme that almost the entire lung is affected. The observations of Brown-Séquard relate to injuries to the base of the brain. Further, a meningitis can regularly be produced; such is usually double, rarely upon only the side of the injury, at times upon the other half alone.

Hypertrophy of the Brain.—Landouzy⁴ reports the case. The child, ten years old, well developed, and intelligent, had never had paralysis nor convulsions; possessed an enormous skull with closed sutures and fontanelles. The brain fitted the skull completely; its convolutions

¹ Deutsches Archiv für klinische Medicin, 1873, page 326.

² Comptes Rendus, lxxviii. 1445; Centralblatt für die medicinischen Wissenschaften, li. 814.

³ Centralblatt für die medicinischen Wissenschaften, 1874, page 209.

⁴ Gazette Médicale, 1874, No. 26; Centralblatt für die medicinischen Wissenschaften, 1874, page 826.

were flattened, the membranes normal, the ventricles narrow. The cerebral substance was very heavy; from the greater development of the frontal and sphenoidal lobes the convexity of the brain was greater in front than behind. All the diameters of the brain were increased, and its weight was nearly nine ounces more than that of the brain of an adult.

The various parts of the brain were apparently normal and proportionally developed. The microscopic examination presented nothing abnormal.

The child was born with a large head, walked at the age of fourteen months, learned to talk at the usual time, and no disease occurred which could be considered a cause for the hypertrophy. Hence a congenital disposition to hypertrophy of the nervous tissue must be accepted.

Lung destroyed by Phthisis. — The case is recorded by Clark.¹ The left half of the thorax was very much diminished in size, and was filled by the emphysematous right lung, the heart, and a hard mass — two and a half by three inches — “lying against the side of the spinal column, between the second and fourth ribs, firmly adherent to the posterior portion of the thoracic wall.” This mass was composed of cheesy matter, pigment, the remains of smaller bronchi, and fibrous tissue covered by a smooth membrane, the thickened pulmonary pleura. A large bronchus proceeded from the mass, but the remains of the lung could not be inflated through this, and there was no evidence of air cells. The right lung was tuberculous; also the left parietal pleura. There were tubercles of the liver and spleen. The right ventricle was soft and flabby; a nodule of hæmorrhagic infarction was found in the liver.

Hypertrophy of the Heart. — Zielonko² has studied experimentally this condition, as well as that produced by direct irritation of the heart. A ligature was placed about the aorta of frogs and rabbits, or a needle was introduced into the wall of the ventricle. The latter method in many cases was without result. The enlargement of the heart was determined by measurements, and by means of the microscopical appearances.

The question then arose whether the hypertrophy was due to the enlargement of already existing cells, or to a new formation of cells, or to both causes. The results of the observations enabled him to state that when the aorta of frogs was constricted by a ligature and but little inflammation followed, an enlargement of the heart was present, due to an actual increase of the muscular substance. Such an increase is relatively greater in young frogs than in old ones. The enlargement is not due to an increase in the size of all the cells, rather to an increased

¹ The Medical Record, 1875, page 1.

² Virchow's Archiv, 1874, lxii. 29.

growth of young cells and an increase of free nuclei. The only conclusion from the experiments on the rabbits was that an increase of the cardiac muscle of a certain rabbit was not due to an enlargement of all the cells.

He further endeavored to ascertain the relation of the muscle to nutrition, to the age of the individual, and to the work accomplished by the muscle. The last two factors were determined by measurements of corresponding muscle-cells of fetuses, children, and adults, and of those from the less active muscles of the same individual.

The effect of nutrition was determined by measurements of the diameters of the fibres from the relatively inactive auricular muscles of decrepit women and well-nourished men of the same age. He concluded that, though the work accomplished by the muscles may influence the size of their fibres, nutrition and age are of much greater influence. A diminution of the diameter of the muscle-cells is alone sufficient to explain the diminished volume of the heart in atrophy.

The size of the muscle-cells of the heart depends on age, general nutrition and inflammatory processes in the heart, and is not increased in hearts hypertrophied from additional work. It is further suggested as possible that hypertrophied hearts found in aged people date rather from an earlier period of life, and that dilatation of the heart alone takes place in old age.

Primary Sarcoma of the Thoracic Aorta. — A case regarded as one of this nature was observed by Bródowski.¹

The tumor was seated in the posterior mediastinum, intimately adherent to the aorta and surrounding the same, but easily separated from the œsophagus, diaphragm, pleura, and vertebræ. The growth seemed to belong to the external coat, though the interior was correspondingly altered, the two being separated by the middle coat, which was very much thinner than normal, having undergone sarcomatous degeneration. There was no evidence of secondary nodules in the thorax, but in the abdomen they were very numerous, not only upon the peritoneum but in the gastric and intestinal mucous membrane, in the spleen, kidneys, liver, and pancreas. The tumor presented the structure of a spindle-cell sarcoma, and the nodules in the abdominal organs were regarded as of embolic origin.

Pancreatic Hæmorrhage a Cause of Sudden Death. — At the last annual meeting of the German naturalists and physicians at Breslau, Zenker² reported three cases of hæmorrhage into the pancreas. The first was that of a man aged forty-eight years, who, previously well, awoke with a feeling of nausea and discomfort, and died within a few minutes. The only anatomical explanation of sudden death found at the

¹ Wiener medizinische Presse, 1874, page 214.

² Allgemeine medicinische Central-Zeitung, 1874, page 1213.

autopsy was a marked hæmorrhagic infiltration of the entire pancreas and the neighboring connective tissue, together with hæmorrhage into the duodenum. The pancreas also presented an extreme degree of fatty degeneration.

The second case occurred soon after. A man aged twenty-eight years, an epileptic, though otherwise apparently healthy and able to work, was found dead in the forest, where he had been seen an hour before, gathering wood. His body furnished no evidence of violence, and at the autopsy an extensive hæmorrhagic infiltration of the pancreas was the only essential alteration. This organ was fatty degenerated, but less so than in the previous case. Both individuals were very fat.

The third case was that of an elderly man, also very fat, periodically prone to drunkenness, who was taken dead from the water. The autopsy gave no evidence of death from drowning. Here, too, hæmorrhage and fatty degeneration of the pancreas and blood in the duodenum were found, and marked hyperæmia of the semilunar ganglion was observed. The habits of the individual with reference to the place where he was found favored the idea that his death was not suicidal but due to his falling into the water while in a dying condition.

The loss of blood alone was considered an insufficient explanation of death in these cases, particularly in the first two. Though in the first case the semilunar ganglion was not examined, it was thought as likely that death resulted from shock through nervous action such as occurs when the abdomen is exposed to mechanical violence.

Attention is called to Fischer's use of Goltz's experiment in the explanation of shock, where paralysis of the heart is produced by blows upon the abdomen of the frog.

Zenker thinks this explanation is favored by the fact that in the second case the heart showed the same conditions as the frog's heart. The immediate cause of death is thus to be regarded as a paralysis of the heart, whether directly or indirectly produced. The medico-legal importance of the examination of the pancreas where sudden death occurs is suggested by the third case.

Congenital Absence of the Kidney. — Watson¹ noted the entire absence of the right kidney and ureter. In the bladder there was no evidence of an orifice for the ureter. The left kidney was lobulated, not enlarged, and was situated close to the brim of the pelvis, in front of the common and external iliac arteries. The left ureter was larger than normal, particularly near the kidney. The left renal artery arose from the bifurcation of the aorta.

In the same article is described an atrophied kidney of the size of a large bean. The left kidney of the same individual weighed nine and one half ounces. The atrophied organ was composed mainly of dense

¹ Edinburgh Medical Journal, 1874, page 13.

fibrous tissue, with occasional tubes, larger in calibre than the ordinary renal tubules. Well-developed Malpighian capsules were rarely observed. The ureter was pervious at its entrance into the bladder, became fibrous near the kidney, and was lost in the loose subperitoneal tissue before reaching the atrophied organ.



John H. Blake Esqr.
77 Kilby St. Boston.